Freie Universität Bozen
Libera Università di Bolzano
Università Liedia de Bulsan

Public Competition
for the admission to the PhD programmes
42nd cycle
Academic year 2026/27
Faculty of Agricultural, Environmental and Food Sciences
PhD Programme in
Mountain Environment and Agriculture

Website: https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/phd-mountain-environment-agriculture/

Duration: 3 years

Academic year: 2026/27

Start date: November 1st, 2026

Official language: English

Art. 1 - POSITIONS

1. A total of 9 positions are available for the PhD programme in **Mountain Environment and Agriculture**; the programme is divided into the following curricula: Curriculum 1 **Sustainable Agricultural Production Systems** and Curriculum 2 **Ecology, Environment and Protection of Mountain Areas**

2. All information about the PhD programme in general, the schedule and its structure as well as the possible research projects listed below can be found at the following link: https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/phd-mountain-environment-agriculture/

3. **Positions with unibz scholarship: 4**

of which for Curriculum 1: 2

for Curriculum 2: 2

Positions without scholarship: 2

Positions tied to subject-related scholarship: 3

Assomela Società Cooperativa: 1

Project 4: Understanding carbon flux dynamics and sequestration capacity in apple orchards

Eurac Research: 1

Project 6: Improving Evapotranspiration Estimation in Alpine Vineyards through Integrated Field Measurements and Earth Observation

Bruno Kessler Foundation (FBK): 1

Project 10: Advancing forest ecology by means of ground robotics and multi-modal data fusion

4. The following list of research projects and related supervisors and linked to positions financed with a unibz scholarship or without a scholarship is listed for illustrative purposes only, as other topics inherent to the activities of the various research groups at the university may be the subject of study.

Research projects and supervisors		
Curriculum 1 Sustainable agricultural production systems		
Title	**Supervisor(s)**	**Notes**
1. Dissemination patterns and reservoirs of latent postharvest pathogens in apple orchards **Project description:** Apple production faces major challenges both in the orchard and during postharvest handling and storage due to various pathogenic interactions. The most important postharvest diseases of apple are caused by fungal pathogens that either infect fruit through wounds in the postharvest stage or establish latent infections in the orchard before harvest. These latent infections remain symptomless until physiological changes during ripening and storage favour pathogen development, at which point rots become apparent. In South Tyrol, several previously unreported latent postharvest pathogens have been detected in recent years, including species of *Colletotrichum*, *Neofabraea*, and *Cadophora luteo-olivacea*. Despite their increasing economic relevance, the infection biology of many latent postharvest pathogens—particularly their key inoculum sources and infection periods—remains poorly understood. This PhD project therefore aims (i) to characterise the spatial and	Prof. S. Baric	

temporal occurrence of representative latent postharvest pathogens in selected apple orchards in South Tyrol and to identify their most likely inoculum sources, and (ii) to investigate the molecular and physiological mechanisms that trigger the transition from quiescent infection to active decay in stored fruit. Environmental monitoring will be carried out by trapping rain-splashed conidia at multiple time points throughout the growing season and by sampling different plant tissues and other potential reservoirs (e.g., mummified fruit or leaf litter). Samples will be analysed using mycobiome profiling, complemented by the development of species-specific quantitative real-time PCR and/or digital droplet PCR assays for sensitive detection and quantification of target pathogens. Furthermore, RNA-seq will be employed to study plant–pathogen interactions. Overall, the project will deliver epidemiologically relevant insights into the orchard ecology and postharvest behaviour of latent pathogens, supporting improved risk assessment. The resulting knowledge and diagnostic tools will facilitate the development of more targeted and sustainable disease-management strategies and help reduce postharvest losses. **Required qualifications:** Candidates should have a solid background in plant pathology and mycology/microbiology, with particular interest in fruit crops and postharvest diseases. Required skills include basic competence in field sampling and experimental design, fungal diagnostics (culture-based and/or molecular), and data handling and statistical analysis. A willingness to work across orchard and laboratory environments is essential. **Preferred qualifications:** Experience with apple production systems and/or postharvest handling and storage is advantageous. Familiarity with molecular biology methods (DNA/RNA extraction, PCR/qPCR) is desirable. Additional preferred competencies include mycobiome/metabarcoding workflows; development and validation of species-specific detection assays (qPCR and/or ddPCR); and transcriptomics (RNA-seq) or other omics approaches for studying plant–pathogen interactions. Experience with environmental monitoring and/or epidemiological analysis are considered an asset. Good		

scientific writing skills in English and the ability to work in an international, interdisciplinary team are expected.		
2. PFAS Contamination Pathways in Agricultural Production Systems **Project description:** This research activity focuses on evaluating the potential pathways of per- and polyfluoroalkyl substances (PFAS) contamination in agricultural production systems. It investigates the occurrence, mobility, and persistence of PFAS within the soil–plant continuum, with particular emphasis on their transfer from environmental matrices and agricultural inputs into crops and agricultural products. The activity integrates soil science, environmental chemistry, and plant physiology to improve understanding of the factors controlling PFAS fate and accumulation. In addition, it explores the implications of PFAS contamination for soil health, food safety, and sustainable agricultural management. The project will be carried out in cooperation with the Laimburg Research Centre (ref. dr. Andrea Lentola).	Prof. T. Mimmo	
3. Mechanistic understanding of root exudate dynamics in the rhizosphere **Project description:** Rhizosphere dynamics, particularly the interactions among root exudates, soil, and microbial communities, are key factors defining plant health and thus agricultural production. This PhD project aims to investigate whether root exudates are actively reabsorbed by plant roots, using model species such as barley and *Arabidopsis thaliana*. The study will employ genetically modified plants with silenced genes involved in bidirectional transport of organic compounds within the soil–plant system. In addition, the project seeks to elucidate the role of soil microorganisms in mediating these processes. The successful candidate will apply a combination of experimental approaches, including the cultivation of genetically modified plants, environmental DNA (eDNA) analysis of soil microbial communities, chemical characterization of the rhizosphere and analytical instrumentation to assess root exudate uptake. **Required qualifications:**	Prof. T. Mimmo	

The ideal candidate should have a strong background in soil chemistry, along with experience in molecular biology techniques and phenotypic screening. Practical expertise in eDNA extraction and analysis, as well as experience working with cultivated plants, is expected. Proficiency in data analysis using the R environment is highly desirable, as well as analytical chemistry knowledge.		
4. Understanding carbon flux dynamics and sequestration capacity in apple orchards **Project description:** The PhD project will focus on the study of the carbon fixation capacity of apple orchards and on strategies to enhance it. Central to this activity is the employment of the eddy covariance technique that provides data of net carbon exchange between soil-vegetation and atmosphere and ultimately informs about the ability of the system to act as a sink or a source for C. Special emphasis will be given to the effects of climatic conditions on C fluxes. Manipulative experiments for testing promising carbon farming approaches will also be carried out. Complementary measurements of soil properties, microclimate and individual C flux components are also foreseen. The experimental fields will be located in the Trentino-South Tyrol Region. It is expected that the PhD student will also interact with the Italian Association of Apple Producers (Assomela). **Required qualifications:** The PhD student is expected to have a background in agricultural sciences or forestry/ecology with good knowledge in plant ecophysiology and crop ecosystems, as well an interest in analyzing complex datasets.	Prof. M. Tagliavini/Prof. D. Zanotelli	Project co-funded by Assomela Società Cooperativa
5. Stomatal optimality in the face of climate extremes **Project description:** In order to allow for the diffusion of carbon dioxide into leaves, and thus photosynthesis, vascular plants have to open their stomata, which inevitably leads to the loss of water vapor through transpiration. The photosynthetic uptake of carbon dioxide is regarded as a benefit for plants, as the assimilated carbon allows for maintaining existing and	Prof. G. Wohlfahrt/ Dr. A. Asensio/ Prof. M. Tagliavini	

growing new biomass and investing in defense and reproduction, while transpiration, conversely, is regarded as a cost. It has thus been suggested that plants should adjust stomatal conductance in order to maximize the benefit of carbon sequestration, while at the same time minimizing the associated costs of transpiration and indeed, such optimal behavior has been observed experimentally and is used as a basis for modeling plant photosynthesis and transpiration. What is unknown though, is whether plants also behave optimally when exposed to extreme climatic events, such as heatwaves or droughts. The goal of this PhD project is to investigate whether different grapevine varieties behave optimally during extreme climatic events. To that end the PhD student will conduct leaf gas exchange measurements and analyze existing prior data both from lab experiments under controlled conditions as well as field manipulations using a variety of stomatal optimality models based on different theoretical assumptions. **Required qualifications:** The PhD student is expected to have a strong background in plant ecophysiology, an interest in mathematical simulation models and skills in programming and analyzing complex datasets.		
6. Improving Evapotranspiration Estimation in Alpine Vineyards through Integrated Field Measurements and Earth Observation **Project description:** This PhD project, jointly developed between Eurac Research and the Free University of Bozen/Bolzano, aims to advance the understanding and modelling of evapotranspiration (ET) in vineyards of the Province of Bolzano. The research will integrate in situ measurements (e.g., eddy covariance, soil moisture, and meteorological data), proximal sensing inputs (e.g., canopy structural, thermal, and multispectral observations), and satellite remote sensing to improve the estimation of vineyard water use across spatial and temporal scales. Central objective of the PhD is to enhance process understanding of ET fluxes, with particular emphasis on partitioning evapotranspiration between vine rows and inter-row areas. By combining flux measurements with structural and spectral information, the project will investigate how	Dr. M. Castelli/ Dr. C. Notarnicola/ Prof. D. Zanotelli/ Prof. M. Tagliavini	Project co-funded by Eurac Research

canopy architecture, soil moisture dynamics, and management practices influence the relative contributions of transpiration and soil evaporation. In addition, the research will focus on the characterization of vine water stress by integrating thermal indicators, vegetation indices, and soil moisture observations with ET-based metrics. The project will develop and validate modelling approaches that link ground-based observations with Earth observation (EO) data to derive robust and scalable ET estimates in heterogeneous vineyard systems. Attention will be given to the structural characteristics and topographic complexity of Alpine vineyards. The outcomes will support improved irrigation management, water resource planning, and climate resilience strategies in viticulture, while also investigating the impact of thermal observations on EO-based ET estimates in the context of future high-resolution missions. **Required qualifications:** We are seeking a highly motivated candidate with a master's degree in environmental sciences, Hydrology, Agricultural Engineering, Remote Sensing, Physics, Geosciences, or a related field, and a strong interest in land-atmosphere interactions and ecohydrology. The ideal applicant has solid quantitative and analytical skills, experience in data analysis (e.g., Python or R), and familiarity with remote sensing and geospatial data. Experience with eddy covariance, evapotranspiration modelling, soil moisture monitoring, or plant water stress assessment is advantageous. The candidate should be willing to conduct fieldwork in Alpine vineyard environments and be motivated to integrate ground measurements and Earth Observation data to advance process-based ET modelling and climate-resilient water management in viticulture.		
Curriculum 2: Ecology, environment and protection of mountain areas		
	Supervisor(s)	**Notes**
7. Evaluating the Impact of the Invasive Pathogen *Dothistroma septosporum* on Pine Forests in the Southern Alps under Global Change **Project description:** While shifts in tree species distribution are generally interpreted as direct responses of plant physiology to climate change, the role of biotic interactions, particularly with	Prof. S. Baric	

pathogens, remains underexplored and is often overlooked. Pathogens such as *Dothistroma septosporum* may act as key mediators of climate change impacts, potentially accelerating or reshaping vegetation dynamics beyond what would be expected from climate effects alone. Pine forests (Pinus cembra, Pinus mugo, Pinus sylvestris, and Pinus nigra) play a crucial ecological and economic role in the Southern Alps, contributing to soil protection, carbon sequestration, landscape value, and the provision of high-quality timber and non-timber forest products. However, these ecosystems are increasingly threatened by pests and diseases, whose impacts may be amplified under changing climatic conditions. The recent emergence of Dothistroma septosporum in the forests of Trentino–South Tyrol represents a potentially serious threat to pine species in the region. Initial field surveys have confirmed the widespread presence of the pathogen, with evidence of severe defoliation, tree decline, and mortality in affected stands. Dothistroma needle blight (DNB) has been detected across a wide altitudinal gradient, from valley bottoms to high mountain areas, highlighting the potential for extensive spread. This project aims to identify the main drivers of pathogen spread and to evaluate their impact on tree health and forest ecosystem dynamics. The study will investigate the ecology of the fungus, focusing on spore dispersal and infection conditions through spore monitoring, microclimatic measurements, and molecular identification techniques. The distribution and severity of the disease will be analysed in relation to environmental variables by integrating micro- and macro-climatic data, with particular attention to the role of climate change. The project will also explore the use of advanced monitoring tools, including remote sensing approaches based on satellite and drone data, to assess forest damage. These methods may be complemented by crown condition analysis and stand structure evaluation to provide a comprehensive assessment of the ecological impact of DNB. **Required qualifications:** The PhD student will conduct research on the interactions between fungal biology, plant physiological processes, and environmental drivers in mountain forest ecosystems, adopting an integrative and data-driven approach.		

Candidates should have a solid background in forest ecology, forest pathology, or related disciplines, along with quantitative and computational skills for the analysis of field and laboratory data. Experience with programming tools such as R or Python and basic knowledge of GIS and spatial data analysis are expected. **Preferred qualifications:** Experience in field surveys in forest ecosystems and familiarity with forest pathogens and their management are considered advantageous. Skills in laboratory analyses, including molecular techniques, are desirable. Experience with remote sensing data (e.g., satellite or drone imagery) is a plus. The ability to work in an international and interdisciplinary research environment, as well as the willingness to conduct fieldwork under mountain conditions, are also considered important.		
8. Climate Change: A Multi-Scale Approach at the Renon Supersite **Project description:** Evergreen needleleaf forests play a key role in the global carbon cycle, acting as highly effective systems for atmospheric CO_2 sequestration. Understanding how these ecosystems respond to ongoing changes in climate and atmospheric composition is essential for constraining future carbon–climate feedback. However, the processes linking tree physiology, growth, and environmental stress remain incompletely understood, particularly due to the limited availability of long-term observations. This project builds on a 26-year dataset from the Renon ecosystem station (Italy), part of the ICOS research infrastructure. The study aims to identify the main drivers of tree growth, carbon uptake and emission by integrating observations across multiple spatial scales. Tree-level measurements (tree-ring series, sap flow, and dendrometric data) will be combined with ecosystem-scale eddy covariance fluxes and landscape-level information on soil carbon stocks and vegetation structure across a four-square-kilometre area. By linking long-term observations with current measurements, the project will investigate how environmental variability and stressors affect plant	Prof. L. Montagnani	

physiological processes and ecosystem functioning. The integration of multi-scale datasets will support a more comprehensive understanding of forest responses to climate change. **Required qualifications:** The PhD student will conduct research on the interactions between plant physiological processes and environmental drivers in mountain forest ecosystems, adopting a multi-scale and data-integrative approach. Candidates should have a solid background in plant physiological ecology, ecosystem ecology, or related fields, along with quantitative and computational skills. **Preferred qualifications:** Experience in handling ecological datasets and familiarity with tree-ring analysis, sap flow measurements, or eddy covariance data are considered advantageous. Proficiency in programming languages such as Python, R, or MATLAB for data analysis and modelling is desirable. The ability to work in an international and interdisciplinary research environment, as well as the willingness to conduct fieldwork in cold conditions, are considered a plus.		
9. Functional Ecology of Endemic Plant Species of the South-Eastern Alps **Project description:** The South-Eastern Alps, including the Dolomites, constitute a hotspot of plant diversity, hosting a large proportion of Alpine endemics. For the endemic plant species that are restricted to these mountain ranges, they represent their only area of occurrence worldwide. In contrast, their closely related congeneric species with ecologically similar niches are more widespread and more frequent within their distribution ranges, creating a unique study system to address fundamental ecological questions about endemism. We propose to carry out a globally unique study aimed at elucidating the mechanisms underlying plant endemism by investigating the functional ecology of some of the most	Prof. C. Wellstein	

emblematic endemic species and their congeneric counterparts in the South-Eastern Alps. The project will build on existing databases on population occurrence, genetic diversity, and biogeography of these Alpine species. We will collect field data on physico-chemical conditions, climatic environment, and vegetation, and we will conduct measurements on plant functional traits both in the field and in the laboratory. Trait measurements will also incorporate herbarium specimens and innovative methodological approaches. Data will be analysed using advanced statistical methods, and the results will be disseminated through international peer-reviewed journals. The findings will further contribute to evidence-based nature conservation planning and management. **Required qualifications:** The PhD student will carry out research in botany, functional plant ecology, and environmental studies in mountain ecosystems. Candidates should have a solid knowledge of the Alpine flora, experience in mountain fieldwork, a background in plant ecology, and skills in statistical data analysis, preferably using the R software environment.		
10. Advancing forest ecology by means of ground robotics and multi-modal data fusion **Project description:** This interdisciplinary PhD project will investigate the integration of ground-based robotic platforms with multi-modal sensing to advance forest ecology, with a focus on linking functional traits to ecosystem functioning. The project aims to connect high-resolution measurements of forest structure, spectral traits, and microclimatic conditions (e.g., temperature, humidity, radiation) to ecological processes across scales. The research will involve the deployment of a robotic sensing system for data acquisition in complex, GNSS-denied forest environments. Complementary sensors (LiDAR, RGB, hyperspectral/thermal imaging, and environmental probes) will be used to capture structural, spectral, and microclimatic information, enabling the extraction of key functional traits and indicators of ecosystem dynamics.	Prof. E. Tomelleri	Project co-funded by Bruno Kessler Foundation (FBK)

On the robotics side, the work will focus on autonomous navigation and mapping strategies to ensure repeatable and spatially consistent sampling. On the data side, the research will address multi-modal data fusion and scaling, leveraging data-driven methods to support the interpretation of trait–environment relationships and ecosystem functioning. The expected developments and outcomes of the PhD might include: • Protocols for deploying autonomous robotic systems capable of autonomous ecological mapping and monitoring • Novel algorithms for multi-modal data fusion tailored to various forest environments • Improved understanding of links between forest structure, microclimate, and ecosystem functioning • Applications in precision forestry, such as early disease detection, carbon stock estimation, and adaptive management strategies • Different benchmarks/datasets to accelerate research in robotics-enabled forest ecology The PhD will be jointly performed at the University of Bolzano (Italy) – Faculty of Agricultural, Environmental and Food Sciences – and Fondazione Bruno Kessler (Trento, Italy) – 3D Optical Metrology unit. **Required qualifications:** The PhD candidate is expected to have a background in geomatics and/or ecology and an interest in processing and analysing complex datasets.		

Short Description of the research groups

Curriculum 1 Sustainable agricultural production systems

Agrofood/agribusiness economics, management, finance and marketing (Prof. C. Fischer, Dr. M. Calvia)

The research activity in this area aims at improving the competitiveness of farms and agribusiness enterprises and the agrofood sector as a whole in South Tyrol and elsewhere. Current approaches and topics include: food supply and value chain economics and management; agribusiness

economics, management and finance; market analysis and marketing research; food marketing; agritourism; regional, agricultural and rural development (in cooperation with Dr. T. Streifeneder, Eurac); agricultural cooperatives, alternative agrofood networks, consumer studies, sustainable consumption, statistical data evaluation and econometrics (cross-section, time series and pooled datasets).

Fruit tree physiology and ecosystems (Prof. M. Tagliavini, Prof. C. Andreotti, Prof. D. Zanotelli, Dr. D. Asensio)

The research focuses on eco-physiological processes that affect the use efficiency of resources and allow for the development of more sustainable production systems in orchards vineyards and berry crops. We study the exchange of CO_2, mineral nutrients, water and energy between soil, plants and atmosphere. Part of the activity investigates adaptation measures that can be adopted to cope with multiples summer stressors, like extreme summer heat, drought and high solar radiation (in cooperation with Prof. G. Wohlfahrt (University of Innsbruck), with Dr. G. Niedrist (Eurac Research) and with Dr. M. Thalheimer (Laimburg Res. Center) as well as agroecological management techniques that the sustainability of management practices. Research approaches include eco-physiological, micrometeorological, isotopic, biochemical, biometric methods, modeling and, in cooperation with the Institute of Earth Observation of EURAC Research (Dr. C. Notarnicola and M. Castelli), the application of spectral analysis. The final aim is the enhancement of the use efficiency of resources in crop production systems, the development of sustainable management techniques that enhance the quality of the produces.

Plant genetics (Dr. S.J. Unterholzner)

The research group studies genetic mechanisms of plants adaptation towards abiotic stress. They use a multidisciplinary approach to analyze genetic, molecular, and physiological details involved in agricultural traits related to root development. Their main interest is to understand developmental programms controlling root developmental plasticity and their role in nutrient uptake as well as in abiotic stress adaptation. The group combines genetics techniques (genome editing, tissue specific and inducible genome editing and gene expression) with transcription factors analysis and molecular imaging and employ primarily the model plant Arabidopsis thaliana, but are setting up translational approaches to test their working hypothesis also in crop plants such as barley, tomato and apple.

Technologies for agroforestry innovations (Prof. F. Mazzetto, Dr. G. Carabin)

The topics involve the application of digital technologies for the management of agricultural and forestry processes in mountainous environments. The aims are: a) to improve the quality of farm management as a whole; b) to optimize the use of machines and process equipment, with the aim of mitigating environmental impacts (i.e.: reduction of drift phenomena during phytosanitary treatments, containment of energy consumption and related carbon footprints, optimization of the water footprint); c) enable the development of alternative niche crops to traditional mountain farming practices, creating alternative sources of income through new models of agriculture designed for extreme environments; d) improve ergonomic and safety conditions for farm operators. Research approaches include both laboratory activities, where the functionality of the machines can

be tested in controlled environments and with particularly sophisticated measurement systems, and field activities, to evaluate the functionality of possible prototypes in their real working contexts. Investigation methodologies will include both the use of various types of sensors (including ground sensing and LiDAR), including new generation sensors, and modeling approaches for physical, environmental and management processes.

Insect chemical ecology and apiculture (Prof. S. Angeli)

The research group investigates the evolutionary biology of chemically mediated insect-plant interactions in agricultural ecosystems, with the goal to develop environmentally friendly pest control strategies through a chemical ecology approach. We study how host plants respond to insect attacks by releasing volatile compounds and the ecological functions they mediate. Using GC-MS, GC-EAD, PTR-MS, and behavioral assays such as olfactometry, arena tests, and field trials, we have achieved significant breakthroughs. These include the "Female Removal (FR)" technique for *Cydia pomonella*, based on kairomonal lures, and an attractive lure for *Drosophila suzukii* using yeast volatiles, with ongoing efforts to optimize these strategies for field applications. Beyond insect-plant interactions, our research extends to apiculture, where we study impact of insecticides on honey bees and pesticide monitoring to improve agricultural sustainability. By integrating chemical ecology with applied research, we develop innovative and scalable solutions for sustainable pest management.

Applied molecular entomology (Prof. H. Schuler)

Our research group is broadly interested in the evolutionary ecology of insect pest species. We are using a combination of genomic and population genomic approaches as well as in vivo experiments in laboratory and semi-field experiments. One of our primary research questions addresses the association of microbes with insects and their impact on the ecology and evolution of their hosts. In particular we study insect vectors of phytoplasma diseases, we investigate the associations of bark beetles with symbiotic bacteria and fungi to understand their role in the population dynamics of this important pest species. Moreover, we study the invasion dynamics of invasive insect species. Our research combines fundamental and applied aspects of the biology of insect pest species with the orientation towards a more sustainable pest management.

Phytopathology (Prof. S. Baric, Dr. L. Carlini)

The Phytopathology group investigates plant-pathogenic organisms affecting crop species and forest trees in South Tyrol. The group focuses on the population structure and diversity of plant pathogens, their interactions with host plants, and the epidemiology of plant diseases. It also develops and implements new methods for plant disease diagnosis and sustainable disease management. The research combines field-based investigations with advanced microbiological and molecular techniques.

Soil Health and Plant–Microbe Interactions Group (Prof. Mimmo, Prof. Borruso, Prof. Villa)

The research group focuses on soil-plant-microbe interactions in agricultural contexts, with a strong focus on cultivated plants affected by biotic and abiotic stressors. Its research is based on a multidisciplinary approach that combines physical, chemical, and biological perspectives to study processes occurring in soils, plants, and their associated environments. Main areas of expertise include root exudation dynamics, plant stress physiology, and the taxonomic and functional diversity of microbial and faunal communities. The group also addresses emerging environmental issues relevant to agroecosystems, including the effects of microplastics on soil-plant-microbe systems. Although its primary focus is on agricultural systems, selected activities may also involve particular non-agricultural contexts or unique ecosystems, such as the Galápagos, when relevant to the study of cultivated plants and their interactions with soil biota. A unifying theme across all research lines is the study of soil as a dynamic system, with emphasis on the interplay among its physical, chemical, and biological properties.

Animal Science (Dr. T. Zanon)

The Animal Science team evaluates and improves dairy and beef production systems by comparing breeds, assessing functional traits such as health and welfare, and developing high-quality, regionally adapted beef chains. Milk quality analyses are an integral part of this work, supporting the evaluation of how feeding strategies, management systems, and genetic factors influence both product quality and overall system performance. A key research line focuses on reducing enteric methane emissions through advanced technologies such as GreenFeed and MIR spectroscopy. These tools allow precise measurement of emissions in dairy cows and breeding bulls, enabling the study of genetic parameters, the testing of plant-based feed additives, and the evaluation of regional feed resources as mitigation strategies. By integrating data from experimental farms and breeding stations, the group develops genetic, nutritional, and management approaches to lower emissions while safeguarding productivity, milk quality, and animal health. Results are shared nationally and internationally to support sustainable, climate-resilient livestock farming in mountain regions.

Grassland farming (Laimburg Research Centre, Dr. G. Peratoner)

The research focuses on productive and environmental aspects of forage systems (addressing both meadows and pastures), depending on the management intensity and on the site conditions and meteorology. Research approaches include the analysis of vegetation dynamics, forage yield, forage production and nutrient fluxes by means of biometric methods and statistical modelling, with possible applications at the interface with remote sensing. The final aim is providing scientifically sound information and innovation for sustainable agronomic management of grassland resources under the climatic and topographic challenges of mountain agriculture.

<u>Curriculum 2 Ecology, Environment and Protection of Mountain Areas</u>

Interdisciplinary landscape, vegetation and conservation ecology (Prof. C. Wellstein, Dr. F. J. White, Prof. N. Hölzel)

The working group addresses regional to global environmental issues, such as biodiversity research,

functional diversity, climate change research, nature conservation, ecosystem restoration and sustainable and resource-efficient land use. We apply a large set of methods tailored for the scale of interest ranging from biogeography to molecular ecology and study various ecosystems, habitats and land-use types. We pursue studies on a global scale and focus on Europe, South America and South Africa. Our research covers Mediterranean, temperate and alpine regions. We combine research on ecological patterns and processes, management and conservation, under natural environmental variation and human impact.

Forest ecology (Prof. R. Tognetti, Prof. L. Montagnani, Prof. E. Tomelleri)

Our research group focuses on understanding montane forest ecology and how these ecosystems respond to both natural and human-induced changes, particularly in relation to climate change. We place special emphasis on biogeochemical cycles and aim to integrate our findings into management strategies that preserve and enhance forest functionality and resilience. Our studies range from examining the ecophysiology of individual trees using advanced technologies like IoT and proximal sensing, to exploring biodiversity and resilience at stand and watershed levels with methods such as eddy covariance, lidar, and UAVs. We also scale up to regional and national levels, employing remote sensing techniques and climate-smart forestry approaches.

River processes and natural hazards mitigation (Dr. A. Andreoli, Prof. L. Mao)

The group investigates the complex dynamics of mountain basins through their hydrological and sediment transport processes and by analyzing their morphological evolution, with a special focus on glacierized environments and on debris flow catchments. The activities are mostly related to field monitoring, GIS modelling and laboratory analysis, and tracers for both water runoff (EC, isotopes) and bedload transport (passive integrated transponders, PITs) are utilized. Ecohydrological issues related to natural and anthropic-related vegetation are also investigated.

Institute for Earth Observation (Eurac Research, C. Notarnicola, M. Castelli)

The Institute for Earth Observation focuses on monitoring environmental dynamics in mountain regions to understand ongoing changes, identify their drivers, and support local communities. To this end, it integrates satellite and in situ observations with both physically based and data-driven models, developing advanced approaches for analysing environmental processes, with particular attention to complex mountainous terrain. The group develops tailored methods for processing satellite data in heterogeneous and topographically complex environments. Its main objectives include improving the monitoring and modelling of the mountain water cycle, advancing drought monitoring and prediction in the Alps, and analysing vegetation and land cover dynamics, including changes in grassland and forest ecosystems across multiple scales. The activities within this PhD program will be carried out in close collaboration with the Biosphere and Hydrosphere research group, which uses Earth Observation to investigate the spatio-temporal dynamics of the terrestrial water cycle, vegetation, and land cover, with a focus on the Alps, and will benefit from the ongoing collaboration between Eurac Research and the research group of Prof. Tagliavini and Prof. Zanotelli at the Free University of Bolzano. This collaboration complements Eurac Research's expertise with a strong background in plant physiology and agrometeorology, which is essential for the validation

and interpretation of plant–atmosphere exchanges derived from EO data against in situ measurements. It also enhances the transferability of satellite-based estimates of canopy temperature and plant water fluxes into actionable information, supporting agricultural practices and decision-making.

5. The application for admission must state the preference for one curriculum and for a maximum of 2 research projects. The preference expressed will be indicative of the interests of the applicant and not binding for the selection committee.

6. Subject-related scholarship positions will have separate rankings. Separate rankings will be also compiled for each Curriculum. Winners of subject-related scholarships must conduct research related to the specified topic. These will be assigned preferentially to applicants who make a specific request in their application.

7. Pursuant to the general part of the present call for applications, the number of positions may be increased as a result of funding provided by other universities, public research bodies or qualified private companies. Notice of such an increase will be given exclusively on the unibz web page dedicated to PhD programs. Applicants wishing to obtain eligibility for any additional subject-related scholarships may make an explicit request to the selection committee during the interview, in order to allow it to assess the specific eligibility.

Art. 2 – ADMISSION REQUIREMENTS

1. Application to the present public competition for the admission at the PhD programme in Mountain Environment and Agriculture may be presented pursuant to art. 4 of the general part of the present call for application, without limitations regarding gender, age or citizenship, by:

a) Applicants holding a postgraduate degree as per Ministerial Decree no. 509/1999, a postgraduate degree as per Ministerial Decree no. 270/2004, a degree of the former Italian university system of the following degree classes: all;

b) Applicants holding an equivalent degree obtained abroad;

c) Applicants achieving one of the above-mentioned titles within the enrolment deadline. In the latter case, applicants will be conditionally admitted to the public competition and are **required to present the qualification by the enrolment deadline, under penalty of forfeiting admission to the programme;**

2. Candidates are expected to have acquired an appropriate educational, and/or cultural and/or professional background in the field of agricultural, environmental, biological or geosciences.

3. Language requirements: a good/very good knowledge of English is required, which will be assessed during the interview.

Art. 3 – APPLICATION FOR ADMISSION

1. In addition to the documentation listed in the general part of the present call for applications, the following documents must be uploaded to the application portal:

a) Motivational letter in English (maximum 1 page), in which the applicant must indicate their preference for research projects (maximum two) and/or for a position with a subject-related scholarship, briefly explaining the reasons for their choice.

b) Updated curriculum vitae in English pursuant to the European format, downloadable at the following link: https://europass.cedefop.europa.eu/en/documents/curriculum-vitae

c) up to a maximum of 2 letters of reference, written in Italian, German or English by a university lecturer or researcher from a research institute.

d) copy of the publications (published or accepted for pubblication) including the master dissertation (pdf version).

In addition to the documentation under a-d, if available, please upload:

e) any English language certificate at level B2 or higher (see the list of certificates recognized by the Language Centre: https://www.unibz.it/it/services/language-centre/study-in-three-languages/). Please note: the certificate must not have been obtained more than 5 years before the application for recognition.

Art. 4 – SELECTION PROCEDURE

1. The selection procedure consists of three phases:

a) applications will be examined ex officio for completeness and fulfilment of the formal requirements; applicants excluded due to incomplete applications or lack of requirements will be notified on the dedicated unibz web page. The publication will have the nature of a notification to all effects. No individual communication will be made.

b) The selection committee will assess the complete applications in accordance with Article 5, considering the qualifications and attached documentation referred to in Article 3. Applicants who reach the minimum score referred to in Article 5 will be admitted to the interview. Admission to the interview, as well as the relevant dates and times, will be communicated on the unibz dedicated web page. Individual communications will be sent in due time to the e-mail address indicated in the application form to applicants admitted to the interview.

c) Interviews may be held in person or by videoconference, at the applicant's request to the selection committee and will be evaluated in accordance with the criteria set out in article 5. Applicants must ensure the use of a webcam to enable them to identify themselves to the selection committee by showing a valid identity document or passport, under penalty of exclusion from public competition.

2. Absence from the tests and/or interviews, non-connection, unavailability of the applicant on the appointed day and/or time or non-exhibition of a valid identity document or passport are a cause for exclusion from the public competition.

3. If technical problems occur after the start of the induvial interview by videoconference, if the problem concerns one or more members of the selection committee, the interview is deferred to another date ex officio; if the problem concerns the applicant, the committee may, subject to the principles of non-discrimination and equal treatment of applicants, postpone the test to another date for justified reasons.

4. Once the examinations have been completed, the relevant selection committees draw up rankings based on the scores obtained by the applicants in the individual tests.

Art. 5 – EVALUATION CRITERIA

1. The selection committee carries out a comparative assessment of the applicants. For applicants who have expressed a preference for positions tied to subject-related scholarships, the committee also ascertains their suitability for the specific subject.

2. The following scores will be awarded during the evaluation of the documents submitted with the application under Article 3:

a) up to a maximum of 23 points for the academic qualifications: scientific proximity of the qualification to the PhD in Mountain Environment and Agriculture, as evidenced by the CV, master's degree/grade, motivation letter and other documents and certificates;

b) Up to a maximum of 7 points for the congruence of the curriculum with the theme chosen by the candidate among those indicated in the list of projects available on the dedicated portal;

3. Applicants who reach the threshold of 18/30 points will be admitted to the interview. Admission to the interview and the relevant dates and times will be communicated on the unibz dedicated web page. Individual communications will be sent in due time to the e-mail address indicated in the application form only to applicants admitted to the interview.

4. The following elements will be assessed during the interview: aptitude for research; possession of a language level appropriate to the language of the programme; argumentative capacity in relation to the theoretical and methodological hypotheses of the research project presented. As the PhD program is offered in English, candidates must have an adequate language level (corresponding to at least intermediate level, B2), which will be ascertained during the interview. A maximum of 20 points will be awarded. The interview is considered passed if at least 12/20 points are obtained.

5. The final score is made up of the sum of the scores obtained in the assessment of the documentation and interview. Applicants and candidates who have obtained at least 30/50 points will be eligible. In the event of a tied score, the applicant with the youngest age will have priority.

Art. 6 – RANKING

1. Applicants and candidates will be admitted to the programs in the order of their ranking until the number of positions available is reached. In the event of equal merit, the applicant who is younger in age shall prevail. In the event of successful placement in more than one ranking list, the winner must exercise the option for only one position. Separate rankings will be drawn up for each curriculum and position tied to a subject-related scholarship.

2. The final rankings will be published on the unibz website on the page dedicated to PhDs. Such publication has the value of an official communication. No individual communication will be made.